- the data tables which contain the codes on which routing and barring take place
- the software to control both the look-up in the data tables and the algorithms which decide whether to bar the call or how to route it
- the amount of memory used to store data tables may need to be increased by a factor of between 2 and 10 depending on the model

Some of the products in the market allow customers to change some of the data tables, notably those for call barring. However, users often prefer to get an engineer to do this because it difficult and time consuming.

Software is not accessible to users, so must be upgraded by maintenance engineers. The NCC modifications will not be covered by existing maintenance contracts, however users will want to use the opportunity of a routine visit by an engineer to get the NCC modification carried out, where possible.

For many types of key system there are continuous software development programmes to provide new features and there is an opportunity to bundle the NCC revisions in with these. For example Mercury is planning to launch "easy access" (single stage call set-up) during 1992 and will try

A few models of key system will require re-approval because of the modifications, but most will simply be reviewed by the manufacturer's own Approval Liaison Engineer.

Most suppliers are in the early stages of planning their approach to the NCC and are still supplying products which will need to be modified. One reason given is that they want to know about S-digits 2-9 before preparing new software. Suppliers were at pains to point out that the changes to introduce the European emergency code, 112, and the new international dialling prefix, 00, will cause levels of disruption similar to those from the NCC. They suggested that some coordination of these events would help them. In practice they expect many systems to be operating without 112, and some to be incorrectly programmed after the NCC date.

Costs

Cost estimates vary from around £100 per system to around £500. They do not correlate with the type of changes involved. It appears that some suppliers have given their standard software upgrade price, while others have based their estimates on the cost of a special maintenance visit lasting around 1 hour. The latter seem to have ignored the time needed to re-load all the site-specific data, which will apply in some cases.

Long term costs will be significantly reduced if manufacturers can redesign their software only once to take account of other changes in the numbering scheme.

		Change required						
	Systems '000s	No change	Data/soft Customer	Data/soft Visit	Data/soft Remote	Chip Change	New Board	New Equipment
Key systems								
Installed base:	426			70%	1%	28%		1%
Changes:	426			298	4	119		4
Costs:								
-Materials								
Minimum				£0		£10		£200
Average				£5		£75		£200
Maximum				£25		£330		£200
-Labour								
Minimum				£25	£35	£25		£0
Average				£100	£100	£75		£0
Maximum				£200	£200	£150		£0
Key system total (£M)	£50.5			£31.3	£0.4	£17.8		£0.9
Survey coverage (% of installed base)	63%							

Appendix 3

Profile of private payphone modifications

Private payphones

Installed base

Suppliers

Responses were received from:

Mercury	Landis & Gyr
BT	South Western Bell
Rathdown Industries	Rocom

These represent some 90% of the installed base.

Products

The main factor which will affect the cost of modifying private payphones for the NCC is whether they use meter pulses or local tariffing:

	Quantity
Meter pulse	361,000
Local tariffing	289,000
Total	650,000

Installed base growth rate:	approx 5% per annum
In-service life of products:	4-8 years

NCC change programme

Meter pulse payphones will need small changes to their software for the NCC, mainly to allow the new emergency code (112) and international dial code (00). They are all designed to meet a BT specifications and will be modified in a similar way, typically an EEPROM change during a site visit.

Local tariff payphones have software and look-up tables to allow call barring and call charging at whatever rate the owner sees fit. These will all need to be modified and a number of ways are being considered:

- customer adds new data

  The most modern of the up-market payphones can be modified in this way, either by manually reprogramming the code table or by replacing a module inside the phone. Generally these products have only been launched very recently and their penetration of the market is very low.

- Add an EEPROM (40% of the installed base)

  Many mid-range and up-market payphones will be modified in this way. The manufacturers may offer various options:

  - return the unit to the supplier for modification
  - take the unit to a dealer for modification
  - arrange a site visit by an engineer

- New circuit board (50% of the installed base)

  A large proportion of the cheaper payphones will need to be modified in this way, mainly because of the extra memory required to hold the additional information in the look-up tables. Again this could be done during a site visit or, more likely, by returning the unit to the manufacturer.

Payphones generally do not have regular maintenance, so most site visits will have to be arranged specifically for the NCC. Further, the manufacturers and dealers do not know where their products are, so users cannot only be informed through indirect means, such as advertising.

There are some 60,000 payphones (around 10% of the installed base) in use which are no longer supported by the manufacturer and will not be able to be modified. These will not work properly after the code change and will have to be scrapped. These are all at the cheapest end of the market.

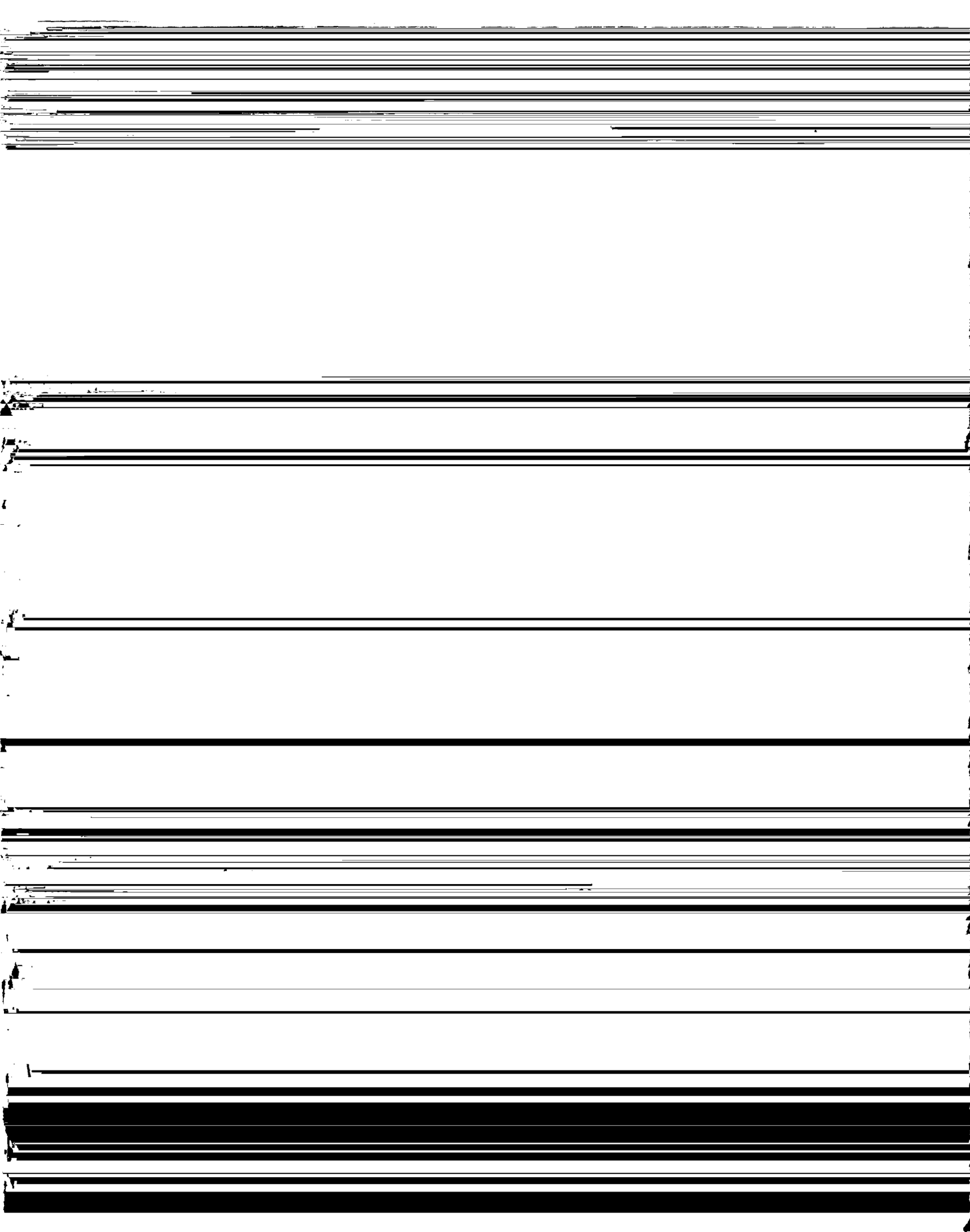
It is also important that for cheaper payphones the cost of a site visit plus a new circuit board will be around £80-£100, while the replacement cost is £130. They will be effectively beyond economic repair. This will cause particularly problems because these phones are typically bought by people who wish to control their domestic phone costs. Users of these payphones are less able to afford such modifications than other payphone users.

To some extent the costs are mitigated by the fact that many owners will not bother to get their payphones modified until:

- they get a bill which is a lot more than the money in the box
- the phone prevents a call being made because the number structure is not recognised

This means that there will be many payphones in use after the NCC which are charging wrongly and are not giving correct call barring (most are incorrectly programmed now). Manufacturers are planning to set up help lines to advise users, but they do not expect this to achieve full coverage of the installed base.

There is no scope for including the NCC modifications in the new coinage modification programme because this has already been started and will be completed by September 1992.



		Change required						
	Systems '000s	No change	Data/soft Customer	Data/soft Visit	Data/soft Remote	Chip Change	New Board	New Equipment
Payphones (Private)								
Installed base:								
Meter pulse	361					100%		
Local tariffing	290		10%			30%	40%	20%
Change:								
Meter pulse	361					361		
Local tariffing	290		29			87	116	58
Total	651					448	116	58
Costs:								
-Materials								
Minimum						£5	£50	
Average						£10	£70	
Maximum						£20	£100	
-Labour								
Minimum						£25	£0	
Average						£50	£20	£130
Maximum						£75	£50	
Payphone total (£M)	£44.9					£26.9	£10.4	£7.5
Survey coverage (% of installed base)	90%							

Appendix 4

Profile of alarm system modifications

Alarm systems

Installed base

Suppliers

Responses were received from:

Modern Alarms	Transmitton
Tunstall	GPT
Securicor	Callbox
Security Alarms	

Products

	Quantity
Security alarms	550,000
Social Alarms:	
- Dispersed alarms	250,000
- Group alarms	23,000
Total	823,000

Installed Base Growth Rate: not known
In-service life of products: 10-15yrs

NCC change programme

Security Alarms

Only digital dialler systems will need modification because of the code change. There will be three levels of change, with the requirement depending on the age of the installed equipment:

- the newest equipment will require the re-programming of a chip. This could be done on-site but in fact it is easier to physically replace chips with ones which have been correctly programmed before issue. Around 70% of the alarms will require this change.

- older equipment will require a new communicator unit within the alarm control box. This will apply to 15-20% of the installed base.

- the oldest equipment, making up the remaining 10-15% of systems, will require a complete new control box.

All of the changes will require a site visit by an engineer, and the need to make all changes within a six month period would mean that relatively few of the visits could be combined with routine maintenance. It will also be impossible to perform all of these additional visits with the existing number of engineers. Additional staff will need to be recruited and trained, making it important to have as much notice as possible.

Administration of the change programme is also a substantial task. A

Although dispersed alarms are more numerous the majority of them can be re-programmed remotely. Where visits are required these need not be performed by an engineer. Re-programming can be performed from the key-pad by anyone after a short period of training. Since many of the people with alarms will receive regular visits from social services for general welfare purposes relatively few special purpose visits should be required.

Costs

Security Alarms

The maximum cost, where a new control panel is needed, would be approximately £250. The minimum, for a chip change, would be £35. The British Security Industry Association has suggested that £100 per system could be a reasonable average cost, while actual costs for the London code change are claimed to be as high as £160 per system.

These costs will be passed on to the customers of the alarm company, although in nearly all cases the control equipment is the property of the alarm company and is provided under a rental agreement. There is therefore a degree of customer resistance to such charges. It has been suggested that this could be reduced if Oftel were prepared to agree with the industry a scale of charges for the changes. However the industry is probably sufficiently competitive for this not to be necessary.

Social Alarms

Cost per system will be low. Many changes will be performed remotely, taking five minutes each and costing perhaps £5. Visits will be more expensive, but since few of them will be made specifically for the purpose the average cost should not exceed £25. The total cost in aggregate is estimated to be £2.5m. This would not be charged to users, but would be absorbed by the local authorities that operate these systems.

Alarm systems

	Systems '000s	Change required: No change	Data/soft Customer	Data/soft Visit	Data/soft Remote	Chip Change	New Board	New Equipment
Installed base:								
Security alarms	550					87%	9%	4%
Social group	23			86%	14%			
Social dispersed	250			15%	85%			
Changes:								
Security alarms	550					477	48	24
Social group	23			20	3			
Social dispersed	250			38	213			
Total	823			58	216	477	48	24
Costs:								
-Materials								
Minimum						£1	£25	£100
Average						£5	£35	£150
Maximum						£10	£50	£200
-Labour								
Minimum				£5	£5	£25	£75	£75
Average				£25	£5	£60	£90	£100
Maximum				£75	£10	£85	£100	£125
Alarm total (£M)	£45.6			£1.4	£1.1	£31.0	£6.0	£6.0

Survey coverage (% of installed base)	
Security alarms	17%
Social group	60%
Social dispersed	60%

Appendix 5

Profile of cellular telephone modifications

Cellular telephones

Installed Base

Suppliers

Responses were received from:

BT	Mitsubishi
Mercury	Hitachi
Racal	NEC

Products

TACS / ETACS	1.2 million currently in use

The responses represent nearly 100% of the installed base.

Installed base growth rate: 8% in 1991
Churn rate: Approximately 18% per annum

NCC change programme

The changing of geographic codes will not require significant modification of cellular telephones. Each user will need to re-programme any stored numbers in his set, as he would for a non-mobile telephone with memories, but no more fundamental change is required.

Should the new numbering scheme change the number ranges of the cellular services themselves, then cellular phones would need to be modified. Each telephone regularly transmits its own number to the nearest base station, so that the system knows how to route in-coming calls. If numbers were changed then each user would need to take his set to a dealer for re-programming. Dealers have the equipment to do this, since it is a routine part of registering a new user, but it would nevertheless the size of the installed base would make such a change a significant exercise.

Costs

The costs attributable to the NCC are nil.

If changes are required under a different S-digit the equipment would normally be taken to a dealer, since it is inherently mobile, rather than be visited by an engineer. This reduces the direct cost significantly, although each user incurs an indirect cost of time taken by the trip. Re-programming is straightforward, so the charge should not exceed £10. Large fleets of vehicles or groups of corporate users could expect to negotiate better rates than this. The maximum cost, excluding the effects of growth or churn, would therefore be £12m. The actual figure may well be less than this.

Appendix 6

Profile of telephone call management system modifications

		Change required					
	Systems '000s	No change	Data/soft Customer	Data/soft Visit	Data/soft Remote	Chip Change	New Board	New Equipment
Telephone Management								
Installed base:	10			83%	10%	6%		1%
Changes:	10			8	1	1		
Costs:								
-Materials								
Minimum				£0		£50		300
Average				£5		£150		500
Maximum				£25		£500		1000
-Labour								
Minimum				£25	£50	£25		
Average				£75	£250	£75		
Maximum				£1,000	£375	£150		
TMS total (£M)	£1.1			£0.7	£0.2	£0.1		£0.0
Survey coverage (% of installed base)	72%							

Appendix 7

Profile of radio paging system modifications

Radio paging equipment

Installed base

Suppliers

Responses were received from
Blick, for on-site paging
NEC and Racal Vodapage for wide area paging

These represent about 10% of the installed base of on-site systems and 50% of wide-area pagers in use.

Products

	Quantity
On-site	
Systems	4,000
Receivers	30,000
Wide area	not known

Installed base growth rate: not known
In-service life of products: not known

NCC change programme

Wide area paging
No changes will be required to wide-area pagers to work with the new numbering scheme.

On-site paging
On-site radio paging systems will normally require no modification. Paging receivers are often used to display telephone numbers as a message. On most receivers the maximum message length is fixed and there could be problems where the limit is less than 10 digits. In most cases it will be good enough not receive the 01 prefix for the telephone number. However, there will be some applications, such as security guards, where it may be necessary for the user to receive the entire number. Where this is the case the receivers will have to be scrapped because they cannot be modified economically. We estimate that this will apply to a maximum of 20% of receivers.

Costs

The costs will be limited to the replacement cost of the receivers, approximately £180 each.

		Change required							
		Systems '000s	No change	Data/soft Customer	Data/soft Visit	Data/soft Remote	Chip Change	New Board	New Equipment
Radio paging									
Installed base:									
Systems		4		100%					
Receivers		30	80%						20%
Changes;									
Systems		4		4					
Receivers		6							6
Total				4					6
Costs:									
-Materials									
	Minimum			£100					£150
	Average			£125					£180
	Maximum			£150					£200
-Labour									
	Minimum								
	Average								
	Maximum								
Paging total (£M)		£1.5		£0.4					£1.1

Appendix 8

Profile of fax machine modifications

Fax machines and fax peripherals

Installed base

Suppliers

Responses were received from:

4-Sight	Hermes ATS
Amstrad	Hogg Robinson Systems
Braid Systems	IBT International
BT	Mitsubishi
Brother	NEC
Canon	Olivetti
Certacom	Textel

These represent over 50% of the installed base of 800,000 machines.

Installed base growth rate: not known
In-service life of products: not known

NCC change programme

Users will need to change 2 things for the NCC. First, the fax machine's ID number should be re-programmed. This is not a necessary condition for it to work, and many are currently wrongly programmed following an office move for example. Second, any numbers stored in the machine's memory will need to be re-programmed. In both cases the memory can store enough numbers for the 10 digit scheme and both can be reprogrammed by users in a short time.

The direct cost for the NCC is nil.

Appendix 9

Profile of modem modifications

Modems

Installed base

Suppliers

Responses were received from:

4-Sight	Textel
Braid Systems	Transmitton
Psion Dacom	Hayes

The size of the installed base is not known.

Installed base growth rate: not known
In-service life of products: not known

NCC change programme

Modems use telephone numbers which are passed to them by communications software, usually in a computer. The software is set up to handle 30-40 numbers in a dial stream to cope with embedded commands which tell the modem to wait, for example, for a second dial tone.

Users will need to change the telephone numbers in either their communications software or their databases. In both cases the direct cost attributable to the NCC is nil.

Appendix 10

Profile of voice mail system modifications

Voice mail systems

Installed base

Suppliers

Responses were received from:
Octel
Staria
Voxad

The responses represent around 30% of the installed base.

Installed base growth rate: not known
In-service life of products: not known

NCC change programme

All voice mail systems will need new telephone numbers to be programmed in. This can often be done by the customer, but in some cases it will be done by a maintenance engineer.

Some systems will need new software, and this will generally be loaded by a maintenance engineer from a floppy disc or a PC connected to the system.

Costs

Where a maintenance engineer is used to load new data or software, the labour charges will be around £150 and the materials charges very small, perhaps £10.

		Change required						
	Systems '000s	No change	Data/soft Customer	Data/soft Visit	Data/soft Remote	Chip Change	New Board	New Equipment
Voice messaging								
Installed base:	0.01		33%	67%				
Changes:	0.01		0.003	0.007				
Costs:								
-Materials								
Minimum			0	0				
Average			10	10				
Maximum			150	25				
-Labour								
Minimum				100				
Average				150				
Maximum				200				
VMS total (£M)	£0.001		£0.000	£0.001				
Survey coverage (% of installed base)	30%							

Appendix 11

Profile of smart socket modifications

Smart sockets

Installed base

Suppliers

Responses were received from
Intercom
Mercury

Intercom have 100% of the installed base of 31,000 sockets at present.

Installed base growth rate:	5% per annum
In-service life of products:	not known yet, very long.

NCC change programme

Single line Smart sockets consist of simple and cheap hardware with routing data stored in memory. Because of the low hardware cost and the fact that customers do not normally re-program the sockets there is currently a debate about whether it will be cheaper overall:

- to replace the circuit inside the smart socket

  it is not clear yet whether this will need to be done by returning th unit to the manufacturer or whether it could be done by the user

- to replace the whole smart socket

  users will fit the new socket themselves

- to attempt to provide simple enough re-programming instructions to allow customers to load the new data themselves.

  this option is attractive because of the low cost to the customer (ignoring their time in doing the work) and the fact that no new hardware is needed

The area has not yet been examined in detail and Mercury is not sure whether the memory capacity is adequate in the existing designs to cope with the NCC. If there is insufficient memory, existing smart sockets will have to be replaced with new hardware and the perceived cost to the customer will be higher. This is likely to cause Mercury considerable problems.

A 2-line version of the smart socket has not been launched yet and few details are available. The price of the hardware is not fixed, the modifications needed are unknown and the means of modifying it (if necessary) have not been identified.

A 2 year lead time is enough to implement the modifications for the code change.

Costs

The maximum cost of changing smart sockets is associated with complete replacement of the socket. In formulating the estimates we have assumed that this is unlikely and that a programme will be set up to return the sockets for modification.

Because the 2-line version will represent only a very small part of the installed base by the NCC, we have ignored it in the cost estimates.

		Change required						
	Systems '000s	No change	Data/soft Customer	Data/soft Visit	Data/soft Remote	Chip Change	New Board	New Equipment
Smart Sockets								
Installed base	31						100%	
Changes:	31						31	
Costs:								
-Materials								
Minimum							£10	
Average							£20	
Maximum							£30	
-Labour								
Minimum								
Average								
Maximum								
Smart socket total (£M)	£0.6						£0.6	
Survey coverage (% of installed base)	100%							

Appendix 12

Profile of smart box modifications

Smart Boxes

Installed base

Suppliers

Responses were received from:
Vanderhof
Mercury

These represent almost 100% of the installed base.

Products

	Quantity
Vanderhof	19,000
Nortec	1,000
Total	20,000

Installed base growth rate: not known
In-service life of products: not known yet, very long.

NCC change programme

This is a very specialised and relatively new market with very few suppliers. All smart boxes can be modified to accommodate the NCC by the addition of new software. This will be done in one of two ways:

- *Site visit by the maintainer*

  Almost all smart boxes will be modified in this way.

- Remote reprogramming from the manufacturers' site

  This is an option for the Nortec smart box but is unlikely to be used because the installed base is small, so economies of scale are low.

Where a site visit is used the re-programming effort will be minimised by downloading the software from either a PC or a portable terminal, eg a Psion Organiser. There is adequate memory in both versions so the new software is not likely to lead to any reduction in features and will not force manufacturers to supply new hardware.

A third type of smart box is due to be launched during 1992. This is a US design and it already copes with multiple carriers and longer telephone numbers than in the UK. No modifications are envisaged to this to cope with the NCC.

Manufacturers have made plans for how the modifications will be carried out, based on their existing maintenance practice. The new software has not been developed yet. A 2 year lead time is enough to implement the modifications for the code change.

There is an opportunity to reduce costs by bundling the NCC modifications in with other software developments, for example the introduction of "easy access" (single stage call set-up to Mercury). During the next 2 years this is only likely to affect a small percentage of the installed base.

Costs

Maintenance of smart boxes is carried out on demand, so the site visits will have to be specially organised. The upper limit on costs is governed by the time taken to install the new software (maximum 1 hour). If there are any material costs, they will be very low.